Claims

[c1] 1. An assembly comprising:

a layer made of ultrasound transducing material;

an electrically conductive coating on a surface of said layer of ultrasound transducing material;

a substrate made of dielectric material;

an electrical conductor formed on a surface of said substrate, said substrate being disposed so that said electrical conductor confronts said electrically conductive coating on said layer of ultrasound transducing material;

an electrically conductive mesh disposed so that a portion intervenes between and is in contact with said electrical conductor on said substrate and said electrically conductive coating on said layer of ultrasound transducing material; and

adhesive material occupying interstices in said mesh and in contact with said electrically conductive coating and said electrical conductor.

[c2] 2. The assembly as recited in claim 1, wherein said adhesive material comprises epoxy resin, polyurethane, silicone, cyanoacrylate or functionally equivalent adhesive.

[c3] 3. The assembly as recited in claim 1, wherein said mesh comprises strands of metal.

[c4] 4. The assembly as recited in claim 1, wherein said mesh comprises strands of polymer plated with metal.

[c5] 5. The assembly as recited in claim 1, wherein said ultrasound transducing material comprises piezoelectric ceramic.

[c6] 6. The assembly as recited in claim 1, wherein said dielectric material comprises a polymer.

[c7] 7. The assembly as recited in claim 1, wherein said mesh has a total thickness of 10 microns or less.

[c8] 8. The assembly as recited in claim 1, wherein said mesh comprises

electrodeposited material.

[c9] 9. An ultrasound transducer comprising:
a body of piezoelectric ceramic material, said body comprising front and rear surfaces;
an electrode formed on said rear surface of said body of piezoelectric ceramic material;
a substrate made of dielectric material;
a pad of electrically conductive material formed on a surface of said substrate, said substrate being disposed so that said pad confronts said electrode;
an electrically conductive mesh disposed so that a portion intervenes between and is in contact with said pad and said electrode; and
adhesive material occupying spaces in said mesh and in contact with said pad and said electrode.

[c10] 10. The ultrasound transducer as recited in claim 9, wherein said adhesive material comprises epoxy resin, polyurethane, silicone, cyanoacrylate or functionally equivalent adhesive.

[c11] 11. The ultrasound transducer as recited in claim 9, wherein said mesh comprises strands of metal.

[c12] 12. The ultrasound transducer as recited in claim 9, wherein said mesh comprises strands of polymer plated with metal.

[c13] 13. The ultrasound transducer as recited in claim 9, wherein said dielectric material comprises a polymeric film.

[c14] 14. The ultrasound transducer as recited in claim 9, wherein said mesh has a total thickness of 10 microns or less.

[c15] 15. The ultrasound transducer as recited in claim 9, wherein said mesh comprises electrodeposited material.

[c16] 16. The ultrasound transducer as recited in claim 9, further comprising an acoustic matching layer disposed in front of said front surface of said body of piezoelectric ceramic material.

[c17] 17. The ultrasound transducer as recited in claim 9, further comprising an acoustic backing layer disposed behind said dielectric substrate.

[c18] 18. An ultrasound transducer comprising:
an array of ultrasound transducer elements, each of said ultrasound transducer elements comprising a respective body of piezoelectric ceramic material and a respective electrode formed on a surface of said respective body, said bodies being substantially acoustically isolated from each other, and said electrodes being substantially electrically isolated from each other; and
a printed circuit comprising an array of pads of electrically conductive material, each pad confronting a respective one of said electrodes, said pads being substantially electrically isolated from each other,
wherein said printed circuit is bonded to said array of transducer elements by adhesive material disposed between said confronting electrodes and pads,
further comprising a multiplicity of sections of an electrically conductive mesh embedded in said adhesive material, each one of said mesh sections being sandwiched between a respective one of said electrodes and a respective one of said pads, each of said mesh sections being separated from adjacent mesh sections by a respective gap.

[c19] 19. The ultrasound transducer as recited in claim 18, wherein said printed circuit further comprises an array of electrically conductive traces, each of said traces being electrically connected to a respective one of said pads.

[c20] 20. The ultrasound transducer as recited in claim 19, wherein said printed circuit further comprises a flexible dielectric substrate that supports said pads and said traces.

[c21] 21. The ultrasound transducer as recited in claim 20, further comprising an acoustic backing layer, wherein said flexible dielectric substrate is sandwiched between said array of ultrasound transducer elements and said acoustic backing layer.

[c22] 22. The ultrasound transducer as recited in claim 18, wherein said adhesive material comprises epoxy resin, polyurethane, silicone, cyanoacrylate or

functionally equivalent adhesive.

[c23] 23. The ultrasound transducer as recited in claim 18, wherein said mesh has a total thickness of 10 microns or less.

[c24] 24. The ultrasound transducer as recited in claim 18, wherein said mesh is electroformed.

[c25] 25. A method of making an electrical connection between a pair of electrically conductive surfaces, comprising the steps of:
placing an electrically conductive mesh and a mass of adhesive material between a pair of mutually opposing electrically conductive surfaces;
pressing said electrically conductive surfaces together with said electrically conductive mesh and adhesive material therebetween with sufficient pressure that said electrically conductive mesh contacts said electrically conductive surfaces; and
curing said adhesive material while maintaining said electrically conductive surfaces in a pressed state.

[c26] 26. The method as recited in claim 25, further comprising the step of electroforming said mesh.

[c27] 27. The method as recited in claim 25, wherein said adhesive material comprises epoxy resin, polyurethane, silicone, cyanoacrylate or functionally equivalent adhesive.

[c28] 28. The method as recited in claim 25, wherein said mesh has a total thickness of 10 microns or less.

[c29] 29. The method as recited in claim 25, further comprising the steps of metallizing a surface on a piezoelectric ceramic transducer element and a surface on a dielectric substrate to form said electrically conductive surfaces.

[c30] 30. A method of assembling an ultrasound transducer, comprising the following steps:
(a) metallizing a surface of a layer of piezoelectric ceramic material;
(b) metallizing a surface of a dielectric substrate in accordance with a pattern;

(c) arranging said piezoelectric ceramic layer, said dielectric substrate, an electrically conductive mesh and a mass of adhesive material so that said metallized surface of said piezoelectric ceramic layer and said metallized surface of said dielectric substrate confront each other, and said mesh and said adhesive material are disposed between said confronting electrically conductive surfaces;

(d) pressing said piezoelectric ceramic layer and said dielectric substrate together with said mesh and adhesive material therebetween with sufficient pressure that said mesh contacts said electrically conductive surfaces; and

(e) curing said adhesive material while maintaining said piezoelectric ceramic layer and said dielectric substrate in a pressed state.

[c31] 31. The method as recited in claim 30, further comprising the following steps:;

(f) laminating an acoustic backing layer to the structure resulting from steps (a) through (e), said acoustic backing layer being disposed on the side of said dielectric substrate opposite to said piezoelectric ceramic layer; and

(g) dicing said piezoelectric ceramic layer, said mesh and said dielectric substrate to form separate acoustically and electrically isolated elements.

[c32] 32. The method as recited in claim 30, further comprising the step of electroforming said mesh.

[c33] 33. The method as recited in claim 30, wherein said mesh has a total thickness of 10 microns or less.